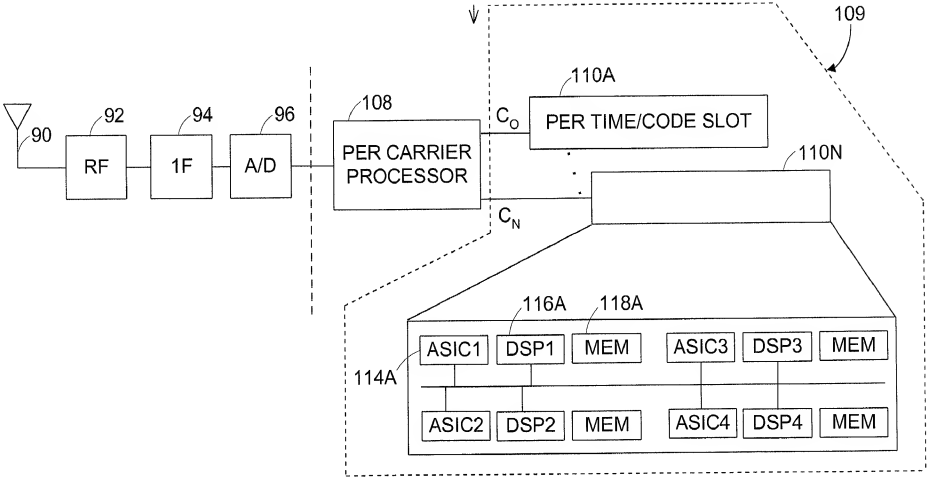


FIG. 1

(PRIOR ART)

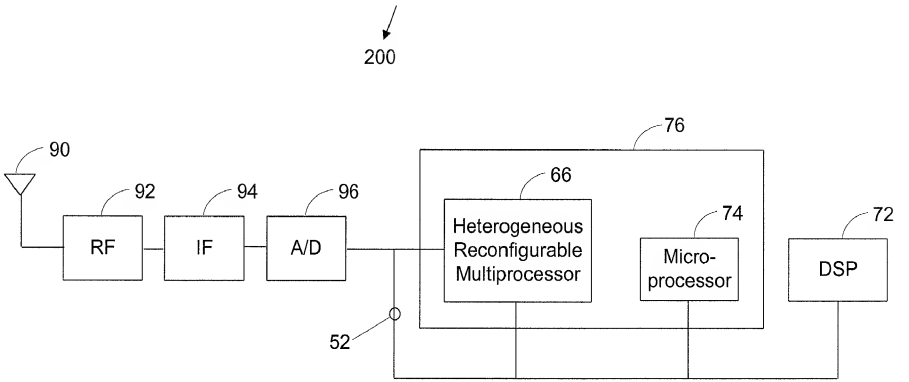

200
90
92
94
96
76
66
74
72
RF
IF
A/D
Heterogeneous
Reconfigurable
Multiprocessor
Micro-
processor
DSP
52

FIG. 2

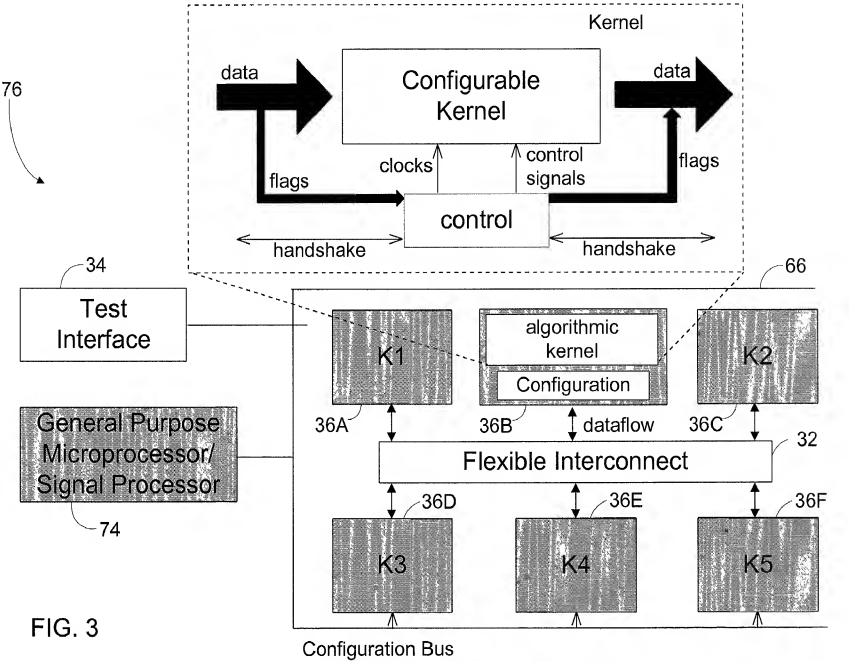


FIG. 3

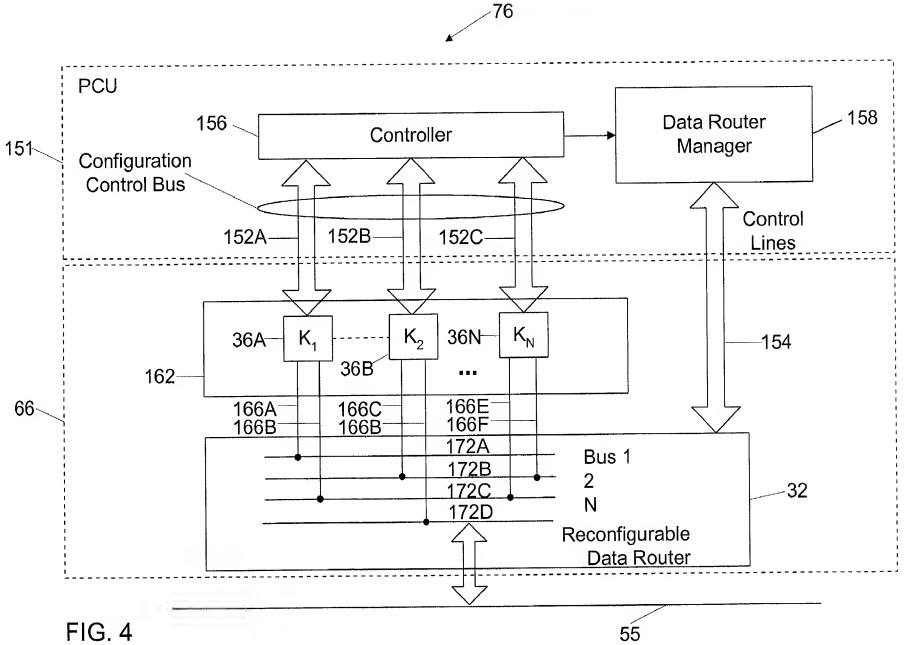

76
PCU
151
156
Controller
Data Router Manager
158
Configuration Control Bus
152A
152B
152C
Control Lines
36A
K_1
K_2
36N
K_N
36B
...
154
162
66
166A
166B
166C
166B
166E
166F
172A
172B
172C
172D
Bus 1
2
N
32
Reconfigurable Data Router
55

FIG. 4

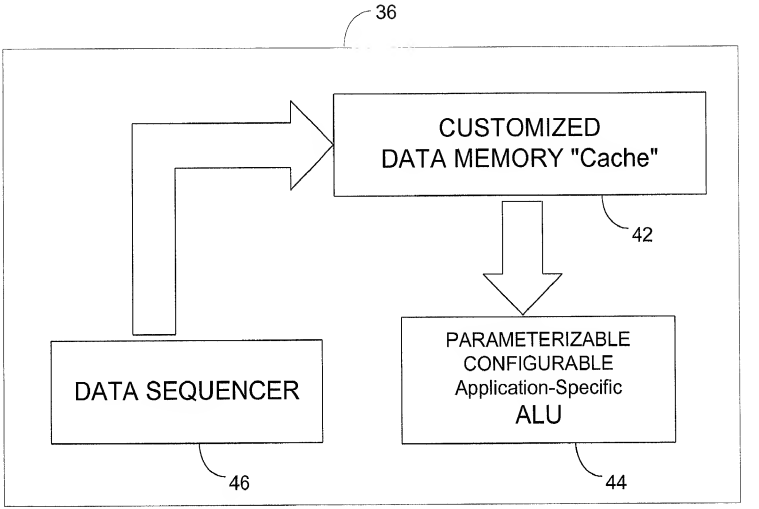
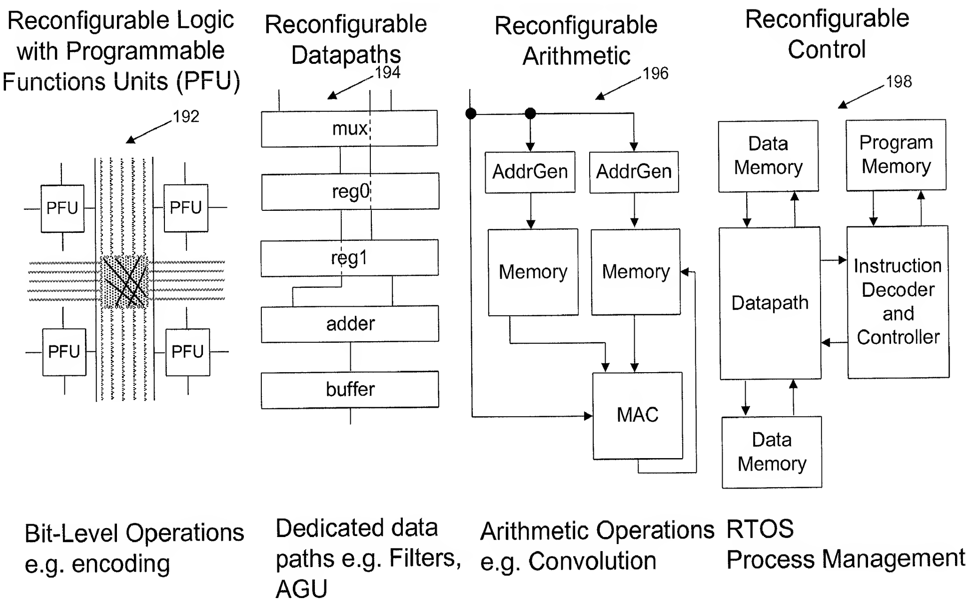

36
CUSTOMIZED
DATA MEMORY "Cache"
42
PARAMETERIZABLE
CONFIGURABLE
Application-Specific
ALU
DATA SEQUENCER
46
44

FIG. 5



Reconfigurable Logic with Programmable Functions Units (PFU)
192
PFU
PFU
PFU
PFU
Reconfigurable Datapaths
194
mux
reg0
reg1
adder
buffer
Reconfigurable Arithmetic
196
AddrGen
AddrGen
Memory
Memory
MAC
Reconfigurable Control
198
Data Memory
Program Memory
Datapath
Instruction Decoder and Controller
Data Memory
Bit-Level Operations e.g. encoding
Dedicated data paths e.g. Filters, AGU
Arithmetic Operations e.g. Convolution
RTOS Process Management

FIG. 6

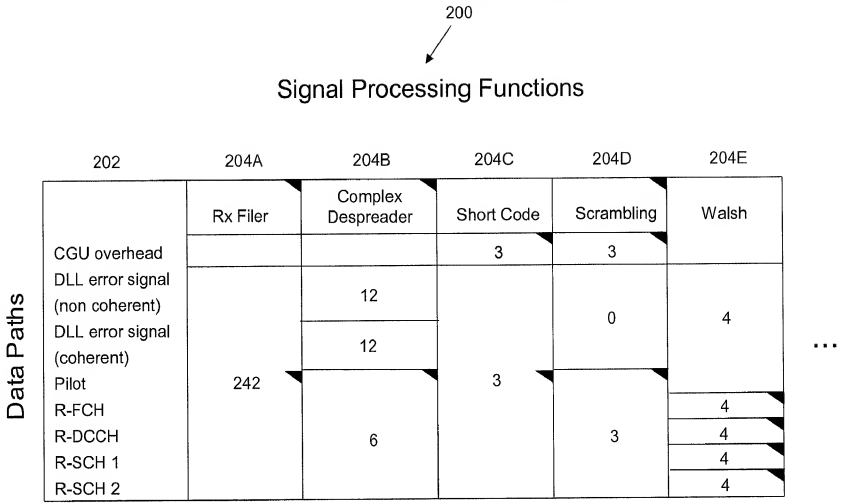


FIG. 7

	TDMA				CDMA				
	IS136	GSM	GPRS	EDGE	IS-95B	IS-2000	WCDMA-FDD	GPS	GLOBALSTAR
Parameter Estimation Functions									
IMS Channel Estimator		X	X	X					
Windowed Average Energy Estimator	X	X	X	X	X	X	X		
ML Symbol Timing Estimator	X	X	X	X	X	X	X	X	X
ML Carrier Phase Estimator	X	X	X	X	X	X	X	X	X
PN Correlator						X	X		X
Matched Filter							X	X	
Interference Energy Estimator						X	X		

FIG. 8

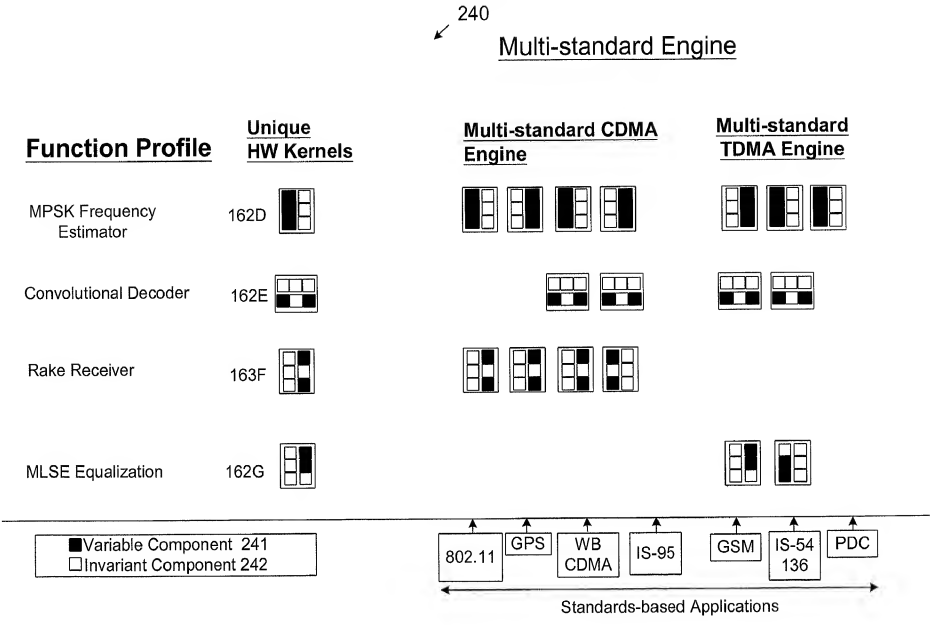


FIG. 9

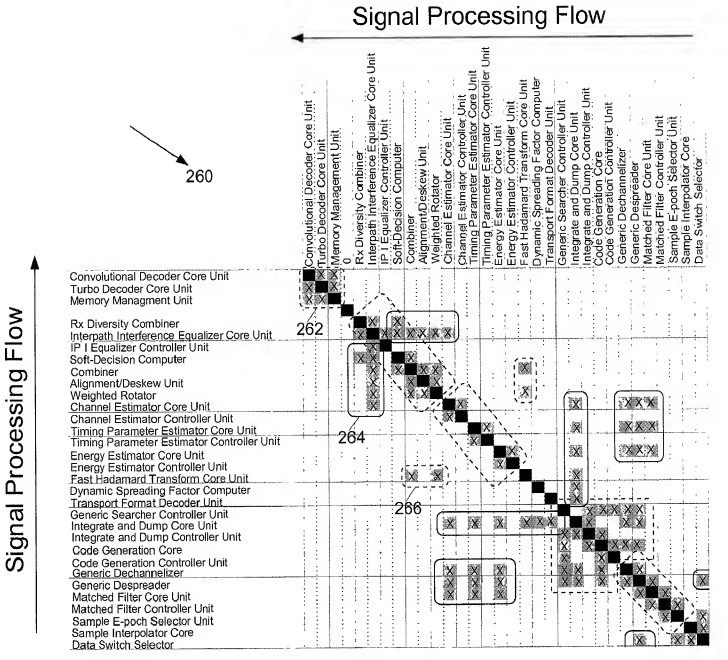

Signal Processing Flow
Signal Processing Flow
260
262
264
266
Convolutional Decoder Core Unit
Turbo Decoder Core Unit
Memory Managment Unit
Rx Diversity Combiner
Interpath Interference Equalizer Core Unit
IP I Equalizer Controller Unit
Soft-Decision Computer
Combiner
Alignment/Deskew Unit
Weighted Rotator
Channel Estimator Core Unit
Channel Estimator Controller Unit
Timing Parameter Estimator Core Unit
Timing Parameter Estimator Controller Unit
Energy Estimator Core Unit
Energy Estimator Controller Unit
Fast Hadamard Transform Core Unit
Dynamic Spreading Factor Computer
Transport Format Decoder Unit
Generic Searcher Controller Unit
Integrate and Dump Core Unit
Integrate and Dump Controller Unit
Code Generation Core
Code Generation Controller Unit
Generic Dechannelizer
Generic Despreader
Matched Filter Core Unit
Matched Filter Controller Unit
Sample E-poch Selector Unit
Sample Interpolator Core
Data Switch Selector

FIG. 10

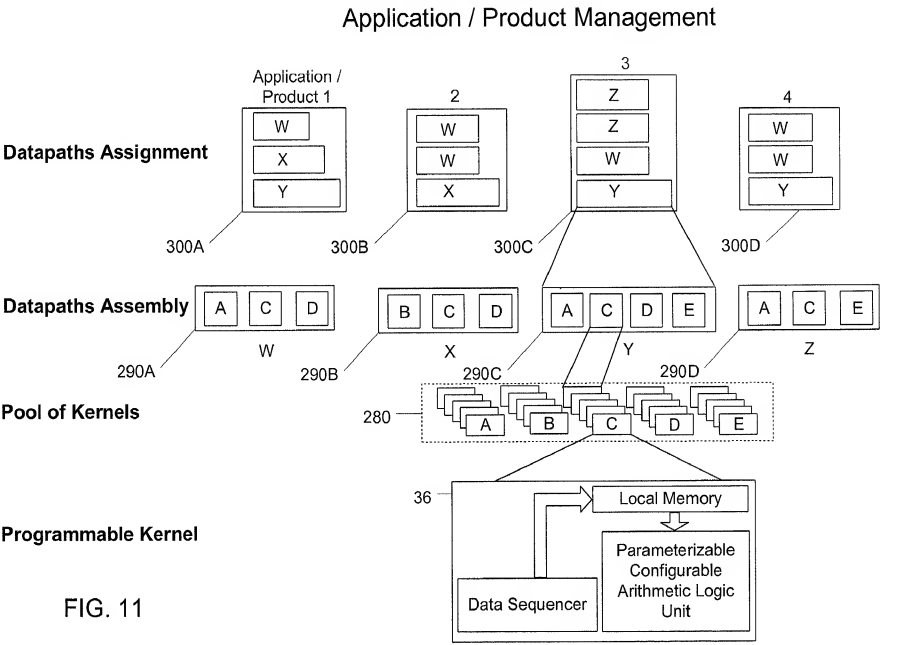


FIG. 11

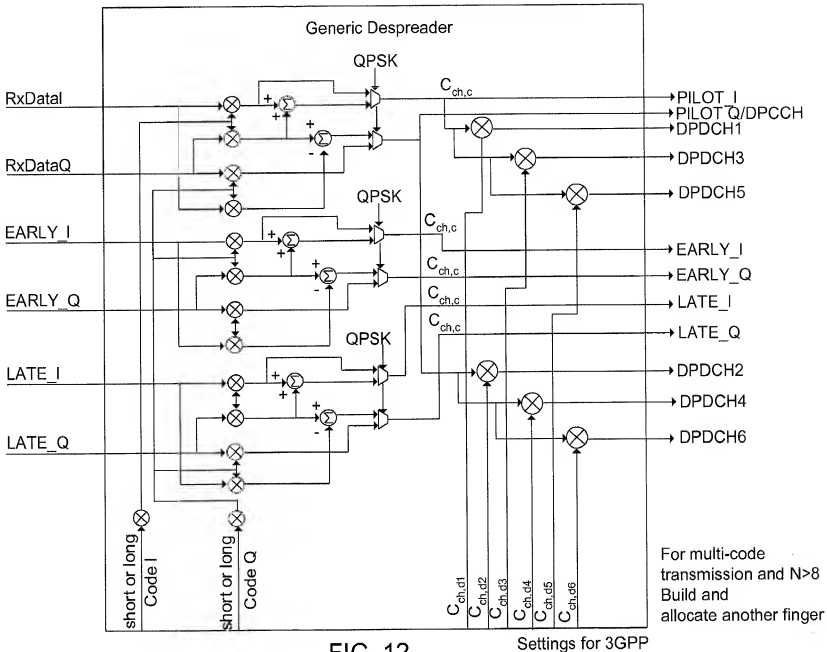


FIG. 12

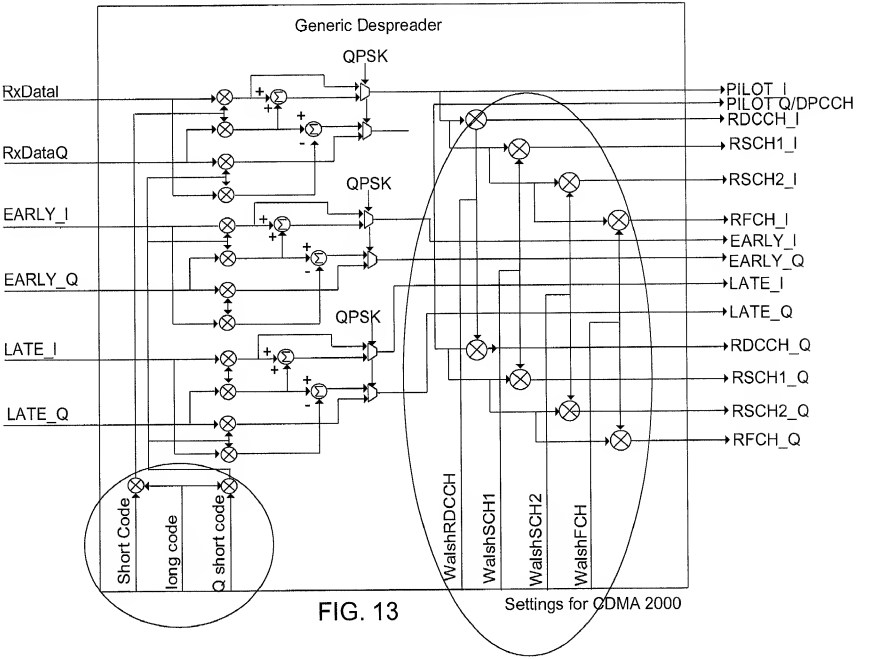

Generic Despreader
QPSK
QPSK
QPSK
RxDataI
RxDataQ
EARLY_I
EARLY_Q
LATE_I
LATE_Q
Short Code
long code
Q short code
WalshRDCCH
WalshSCH1
WalshSCH2
WalshFCH
Settings for CDMA 2000
PILOT_I
PILOT Q/DPCCH
RDCCH_I
RSCH1_I
RSCH2_I
RFCH_I
EARLY_I
EARLY_Q
LATE_I
LATE_Q
RDCCH_Q
RSCH1_Q
RSCH2_Q
RFCH_Q

FIG. 13

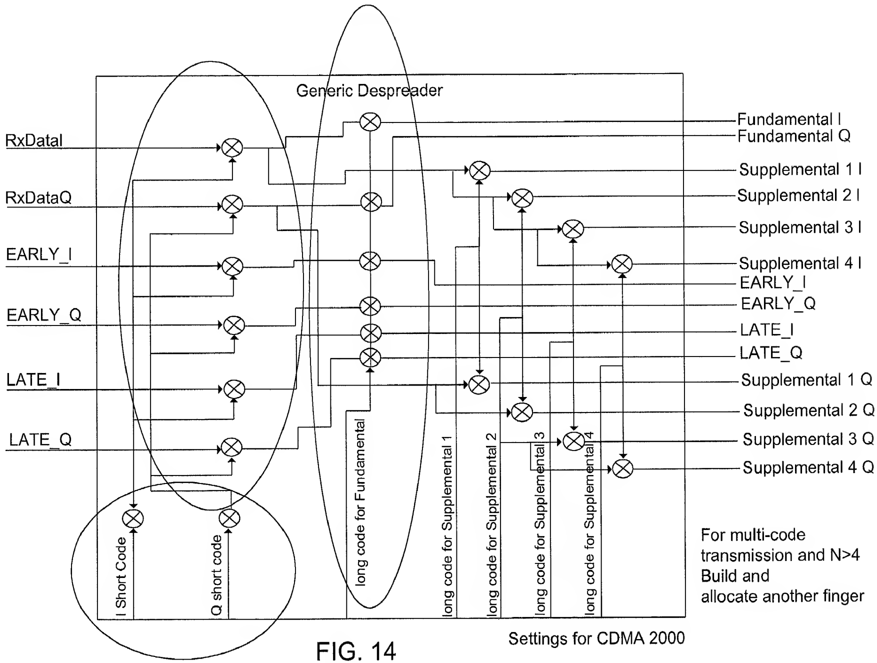

Generic Despreader
RxDataI
RxDataQ
EARLY_I
EARLY_Q
LATE_I
LATE_Q
I Short Code
Q short code
long code for Fundamental
long code for Supplemental 1
long code for Supplemental 2
long code for Supplemental 3
long code for Supplemental 4
Fundamental I
Fundamental Q
Supplemental 1 I
Supplemental 2 I
Supplemental 3 I
Supplemental 4 I
EARLY_I
EARLY_Q
LATE_I
LATE_Q
Supplemental 1 Q
Supplemental 2 Q
Supplemental 3 Q
Supplemental 4 Q
For multi-code
transmission and N>4
Build and
allocate another finger
Settings for CDMA 2000

FIG. 14

CDMA Computation Unit Library	
Front End Processing Sample Interpolation	*Parameter Estimation* Energy Estimator Timing Parameter Estimator Channel Estimator
Chip Rate Processing Sample Epoch Selection Matched Filter Generic Despreader Generic Dechannelizer Code Generation Unit Integrate and Dump Generic Searcher Control	*Channel Element Processing* Alignment/Deskewing Combiner Soft Decision Computer Interpath Interference Equalizer Receive Antenna Diversity Combiner
Symbol Sequence Processing Transport Format Decoder Dynamic Spreading Factor Computer Fast Hadamard Transform Rotator/Squarer	*Interleaving* Deinterleaver Controller
	Channel Decoding Turbo Decoder Convolutional Decoder

FIG. 15

TDMA Computer Unit Library	
TDMA Modem Transmitter Pulse-shaping Multiplexing	*TDMA Modem Receiver* Front-end Filtering Adaptive Demodulation
Link Adaptation (AMR) Antenna Transmit Diveristy	Synchronization Adaptive Parameter Estimation Diversity Combining Link Adaptation
Channel Decoder Reed Solomon Codes Decoding Fire Codes Decoding Decryption Deinterleaving	*Channel Encoder* Encoding Encryption Interleaving

FIG. 16

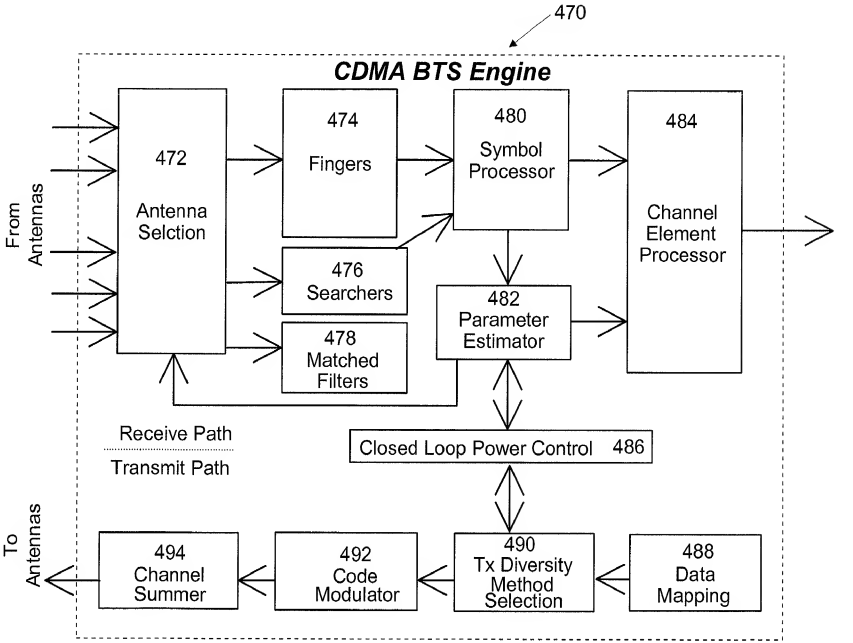

470
CDMA BTS Engine
From Antennas
472
Antenna Selction
474
Fingers
480
Symbol Processor
484
Channel Element Processor
476
Searchers
478
Matched Filters
482
Parameter Estimator
Receive Path
Transmit Path
Closed Loop Power Control 486
To Antennas
494
Channel Summer
492
Code Modulator
490
Tx Diversity Method Selection
488
Data Mapping

FIG. 17

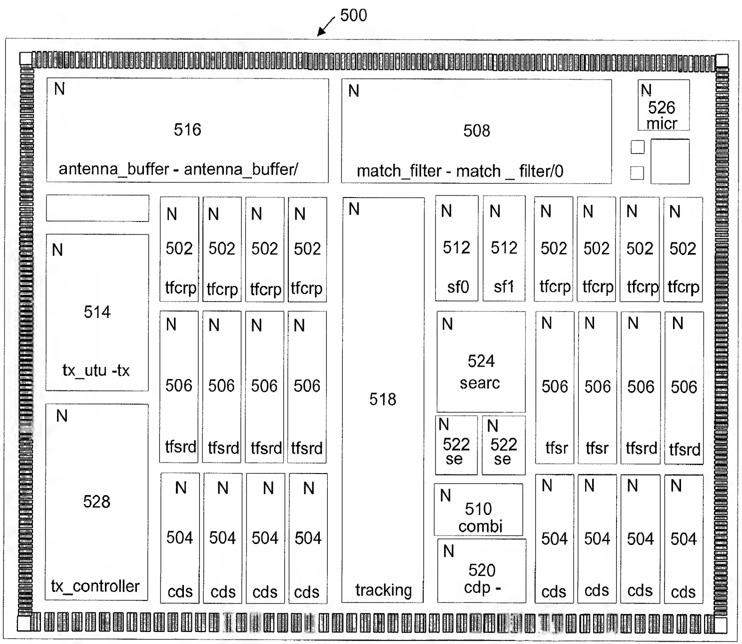

500
N
516
antenna_buffer - antenna_buffer/
N
508
match_filter - match _ filter/0
N
526
micr
N
514
tx_utu -tx
N
528
tx_controller
N
502
tfcrp
N
506
tfsrd
N
504
cds
N
518
tracking
N
512
sf0
N
512
sf1
N
524
searc
N
522
se
N
510
combi
N
520
cdp -
N
506
tfsr

FIG. 18